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ABSTRACT

Recognizing that children's spontaneous use of text structure facilitates their comprehension of expository prose, a study examined the transfer effects of graphic organizer instruction on 24 fourth grade students' ability to use top-level structure in the comprehension and recall of new content area material. Subjects were randomly assigned to one of three conditions. Those in the two experimental conditions received instruction in the use of graphic organizers for 14 class periods and 7 class periods respectively, while control group subjects were taught by the reading-recitation method. Criterion measures consisted of both written free recalls administered before, during, and at the end of the instruction period, and a multiple choice test on the social studies material covered during the experiment. Results indicated that the length of the treatment period was a critical variable, as students in the 14-day graphic organizer group comprehended and recalled significantly more information than control students, while students in the 7-day treatment group showed no reliable difference from control group students. No reliable differences appeared in the three groups' scores either in the first recall passage measuring transfer of knowledge or in the multiple choice test. (MM)

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Knowledge of Text Structure and Its Influence on a Transfer Task

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Children's Transfer of Text Structure Learning
to New Content Material

From the time of its inception through the present, content area reading instruction has had as its primary goal the development of students' reading-to-learn strategies (Moore, Readence, & Rickelman, 1983). Beginning in the early 1900's, a series of events occasioned by a shift in American educational thought led to the emergence of content area reading instruction as a distinct specialty within the field of education. Concurrent with its development arose such issues as where, how, by whom, and when should instruction in content area reading take place. The last of these issues, with its focus on age or grade level, has particular relevance for this study.

According to the recent historical investigation conducted by Moore and his colleagues, the present-day emphasis on content area reading instruction for middle school and senior high students began during the 1940's and 1950's. During that time the dominant form of reading instruction at the secondary level was the pull-out remedial reading program. When educators became aware of how ineffective such a program was in helping students transfer their reading skills across disciplines, they began to call for the teaching of reading in every subject area (Bond & Bond, 1941; Strang, 1937). Prior to that time, however, the bulk of the literature on content area reading instruction had focused on the elementary-aged student.

That a refocusing of this attention may once again be in the offing is suggested by the small but growing number of studies aimed at helping children in the upper elementary grades develop strategies for better comprehending their content area texts (e.g., Adams, Carnine, & Gersten,

1982; Boothby & Alvermann, in press; Peters, 1983). Paralleling this growth of interest in promoting children's strategic knowledge is a line of research investigating elementary students' awareness of the different organizational patterns that characterize expository text (see Englert & Hiebert, in press). Together, these two lines of research reflect an effort to apply what has been learned from previous research, namely, that the lack of strategic skills is a source of higher-order reading difficulties (Collins & Haviland, 1979) and that one strategic skill in particular--the use of text structure--is especially conducive to improving comprehension and recall of expository prose (Meyer, 1975; McGee, 1982; Taylor, 1980).

Although children's spontaneous use of text structure is known to facilitate their comprehension of expository prose, several concerns have been raised regarding the implications of this finding for the classroom teacher. Tierney (1983), for instance, has questioned the efficacy of recommending that teachers provide direct instruction in text structure when researchers still lack evidence of the effectiveness of this practice with a variety of text- and reader-types. Englert and Hiebert (1984) have expressed concern not so much with <u>whether</u> to teach elementary students to use text structure as a comprehension aid but rather, how best to instruct them in its use.

The present study addresses both of these concerns in that it is a text structure instruction study designed to investigate the transfer effects of a specific strategy, the graphic organizer, on fourth-grade students' ability to use top-level structure as an aid in the comprehension and recall of content area text. As such, it replicates an earlier 3-month-long exploratory classroom training study in which we found

tentative support for the use of graphic organizers to highlight a text's top-level structure.

The study reported here, however, is an improvement, design-wise, over the earlier one in several important ways. First, passages from tradebooks which contain content similar to that of the students' social studies text were included to test the transfer effect of graphic organizer instruction on material that was assigned to be read independently. Second, the length of the training time was varied. This permitted an examination of Gordon's (1980) and Tackett and Dewitz's (1981) contention that length of instruction is a critical variable in elementary classroom training studies. Third, students were randomly assigned to treatment condition. This represented a definite advantage over the earlier study's intact classes. Finally, all groups were taught by the same teacher, who was trained by one of the experimenters in the use of graphic organizers. This eliminated a major weakness of the previous investigation in which teacher effect posed a threat to internal validity.

Method

Subjects

A group of 24 fourth-grade students who attended school in a small, midwestern city school district participated in the study. There were approximately the same number of girls and boys. Nationally-normed mean grade equivalencies for this group were available on two tests. On the reading subtest of the Iowa Tests of Basic Skills (Houghton Mifflin, 1978), the mean was 5.45 (SD = 1.16). On the Cognitive Abilities Test (Houghton Mifflin, 1971), it was 4.53 (SD = .98). All subjects were from

a predominantly middle-class background. Slightly more than one-fifth of the children represented ethnic groups other than Caucasian.

Materials

The materials used in this study were of three types: text passages, graphic organizers, and criterion measures. Within the text category, there were practice and experimental passages. The practice passages were subsections of Chapter 3 from the The Making of Our America (Allyn & Bacon, 1974) and pertained to the colonists' bid for independence from England. The Making of Our America was one of two alternative texts used regularly in the fourth-grade social studies classes. As is typical of content area textbooks written for the elementary school student, Chapter 3's major type of top-level structure was enumeration, or simple listing. Identified by Englert and Hiebert (1984 .) as one of the two most salient types of text structure for young readers, enumeration is described as "a text structure in which a series of facts, details or components related to a given topic is presented as a list of points" (p.).

There were three experimental passages, each with an approximate reading difficulty level of fifth grade according to the Dale-Chall (1948) readability formula. One, the "Oregon Trail," consisted of 189 words and was part of the same text from which the practice chapter came. Its purpose was to serve as a means for establishing baseline data about the subjects' ability to produce written free recalls over what they had read. This information was the source of the covariate in subsequent data analyses. The other two experimental passages, "The Tobacco Trade" and "The New England Harbor," consisted of 129 words and 130 words, respectively. They were brief chapters in tradebooks written for the elementary-aged student. Their purpose was to serve as transfer passages

at the close of the short- and long-term training portions of the study. In addition to being similar in reading difficulty level, all three passages were about early America and were revised only slightly by the investigators to match the enumeration top-level structure of the practice material.

Graphic organizers were prepared jointly by one of the investigators and the social studies teacher. As a means for helping students attend to the author's organizational plan, they most closely resemble Gordon and Braun's (1981) macro-cloze technique for "filling in" deleted text structure. The graphic organizers used in the present study were paper and pencil tasks which required students to complete a diagram by using key vocabulary terms from the text. Those terms, some of which were missing from the partially completed diagram (and hence represented by empty slots) were joined by lines and arrows to represent spatially how superordinate and subordinate ideas were related. Completed organizers reflected the author's organizational plan, or top-level structure. All organizers were put on overhead transparencies from which copies were made for students' individual use. (For a fuller discussion of graphic organizers, see Barron, 1969, and Earle, 1970.)

Finally, the criterion measures consisted of both recall and recognition type tasks. Written free recalls were the measures used to assess students' comprehension and retention of passage-length material (two practice passages, two transfer passages, and the passage used for gathering baseline data on students' ability to produce written free recalls). The rationale for choosing written free recall rather than oral free recall included the desire to make all phases of the instructional training study resemble a regular school task in as many ways as possible.

Since the fourth graders in this study were involved in some type of expository writing on a daily basis, written free recall was judged to be a familiar school task. Also, the students' above average verbal ability supported the use of such a measure as demonstrated earlier by Dunn, Mathews, and Bieger (1979).

An 18-item multiple-choice test was constructed by the investigator and the teacher to measure students' comprehension and retention of the information contained in the practice chapter. Each question consisted of a stem followed by four choices (a correct response and 3 distractors). It was similar in construction to tests that the children typically took at the end of a chapter or unit in their social studies text.

Procedure

Subjects were randomly assigned to one of three conditions. Those in the two experimental conditions received instruction in the use of graphic organizers for 14 class periods and 7 class periods, respectively. Control group subjects were taught by the reading-recitation method, an approach typically used by their teachers.

With one exception--Day 3, a snow day--the study was conducted on consecutive school days. In all, it extended over 14 class periods. Each period was 25 minutes in length, and each group received the full 25 minutes of instruction time, insofar as it was possible, taking into account the usual interruptions. The Experimental and Control groups were rotated from day to day as to meeting time, with the Experimentals meeting first on Day 1 and the Controls meeting first on Day 2 and so forth on each subsequent day. Because the practice chapter was from a social studies text normally used by the subjects, the sessions replaced regularly scheduled social studies classes.

The teacher, who taught all three groups, had majored in social studies and was one of the regular fourth-grade teachers in the school where the study took place. A student teacher, who was assigned to one of the fourth-grade homerooms, taught a creative writing unit to whichever groups were not being instructed by the regular teacher. One of the investigators observed each social studies session (the Control group as well as the Experimental groups) to make certain that instruction for the three groups was consistent except for the use of the graphic organizer.

Prior to the start of the study, one of the investigators and the social studies teacher met to discuss the practice chapter and to construct the accompanying graphic organizers. The first three organizers were designed with continuity in mind. That is, to give the students a sense of the overall structure of the text and to guard against the possibility that they would see the organizers as discrete and unrelated, the last slot to be completed on graphic organizer #1 appeared as the first slot on organizer #2 and so on. Additionally, scripts for the first few lessons were written to ensure that there was instructional consistency among the groups.

Two days before the study began, subjects read and recalled "The Oregon Trail." They were instructed to read the passage carefully in preparation for writing down all that they could remember about it. Following a brief interpolative task to control for short term memory effects, the teacher directed the subjects to write as much of the passage as they could from memory, using the author's words whenever possible. Baseline data resulting from this pretest of subjects' ability to produce written free recalls served as the covariate in later analyses.

On Day 1 of the study the social studies teacher explained to the Experimentals that in order to help them better understand and remember

what they read, she was going to show them how to use a special kind of diagram called a graphic organizer. Displaying an example of a graphic organizer on the overhead projector, the teacher demonstrated 1) how just a few words connected to other words and/or empty slots could be used to represent the author's organizational plan for a particular segment of text, and 2) how that plan could be used to comprehend and remember text. After this brief introduction to the purpose of the organizer, the students were instructed to read the heading in the practice chapter and to compare it to the first vocabulary term in the graphic organizer. Both dealt with the concept of independence. Following a discussion of that term, the teacher directed the students to read the next three pages of text. She then helped them summarize what they had read by having them fill in the appropriate empty slots on their individual copies of the graphic organizer. Upon the completion of each organizer, students' attention was again drawn to how the diagram provided a visual display of the author's organizational plan and how that plan could help them comprehend and retain what they read.

Instruction differed for the controls; they read the same material but without the aid of an organizer. They read silently (or orally) and then answered the teacher's questions either orally or in writing. No attempt was made to help the controls understand how their text was organized.

The procedure for Day 1 was repeated on Days 2 and 3. On Day 4 all subjects read and recalled in writing a portion of the practice chapter in their social studies textbook. Days 5 and 6 were a repeat of Day 1. On Day 7 all groups read and recalled the first of the two transfer passages ("Tobacco Trade"). Since the purpose of this passage was to test

for transfer of learning, no graphic organizer was presented. Subjects were told that they should read and study the passage in preparation for retelling it in writing. Again, an interpolative task was used to control for short term memory effects. Day 7 also marked the last day of graphic organizer instruction for the short-term Experimental group; after that time, their instruction was the same as the control group's. Days 8-10 were repeats of Day 1 for the long-term Experimental group. On Day 11, all groups produced their second free recall over practice material (a repeat of Day 4). Days 12 and 13 were repeats of Day 1 for the long-term Experimentals. On Day 14 all three groups read and recalled the second transfer passage ("The New England Harbor"). Directions remained the same for Day 14 as for Day 7. Finally, the multiple-choice test was administered to all subjects upon the completion of Chapter 3, the practice chapter in their social studies textbook.

Scoring

Two independent judges scored the subjects' written free recalls on the "Oregon," "Tobacco," and "New England Harbor" passages for gist recall. Tally sheets containing each of these passages' idea units, parsed according to Johnson's (1970) procedure, provided the means for scoring the recall protocols. Interscorer reliability was .92 for "Oregon," .94 for "Tobacco," and .92 for "New England Harbor." Differences were resolved in conference. Items on the multiple-choice test were accorded one point if correct, zero if incorrect. All multiple-choice tests were scored by both the teacher and one of the investigators.

Results

The dependent measure used to assess whether varying the length of graphic organizer instruction produced a transfer effect was the total number of idea units recalled on each of two tradebook passages. Separate one-way analysis of covariance procedures (with scores on the "Oregon" passage as the covariates) produced a significant effect for the "New England Harbor" passage, $F(2,20) = 3.74$, $p < .05$, but not for the "Tobacco Trade" passage, $F(2,20) = 1.72$, $p > .20$. Dunnett's procedure (a multiple-comparison follow-up to test differences between the Control group and each of the Experimental groups) was applied with alpha set at .05. As indicated in Table 1, the 14-day Experimentals recalled significantly more ($\bar{X} = 6.00$, SD = 4.50) idea units than the Controls ($\bar{X} = 3.12$, SD = 2.64). However, there was no significant difference between the 7-day Experimentals and the Controls. Table 1 also contains descriptive data for the multiple-choice test. A one-way analysis of variance revealed that the three treatment groups did not differ reliably from one another on the recognition task. $F(2,21) = 2.32$, $p > .10$.

Insert Table 1 about here

Discussion

The purpose of the present study was to examine the effects of teaching elementary-aged students how to use text structure as an aid to comprehending and retaining information from content area texts. Treatment conditions varied as to the length of time subjects were instructed in the use of graphic organizers, and tests for transfer effects were conducted after the 7th and 14th day of instruction. In addition, subjects took an

end-of-chapter multiple-choice test over practice material from their regularly assigned content area text.

Support was found for Gordon's (1980) and Tackett and Dewitz's (1981) contention that the length of the treatment period is a critical variable in classroom training studies. Students in the 14-day graphic organizer group comprehended and recalled significantly more information than those who received no instruction in the use of text structure. However, no reliable difference was found between those who had only 7 days of instruction and those who had none. This latter finding corresponded to one reported by Huard (1983) in a study designed to test the effects of student-constructed graphic organizers on independent learning from text. After a 7-day training program in which assistance to students in identifying and arranging key vocabulary was gradually faded out, Huard reported no advantage for the graphic organizer subjects over the controls on either recognition or recall tasks.

The fact that the type of graphic organizer used in this study was effective is interesting from still another point of view. Moore and Readence (1983), in their most recent meta-analysis of graphic organizer research, reported a medium effect size for organizers that were constructed <u>after</u> the reading task, compared to only a small or slight effect size for those used prior to or in conjunction with other learning aids. Although students in the present study were expected to spend some time discussing the graphic organizer and its relation to their text's top-level structure prior to actually reading the text, the majority of their time was spent in completing the organizer after they had finished reading. In this respect, therefore, the organizer functioned in a manner much like Moore and Readence's findings would predict.

The graphic organizer seemed to have inherent appeal for the teacher, at least as judged by her unsolicited comments to one of the investigators. Perhaps this unexpected effect derived, as Moore and Readence have noted, from a feeling that graphic organizers help teachers clarify instructional goals and determine ahead of time the areas in text that are most likely to cause children problems.

In addition to their appeal to teachers, graphic organizers were also valued apparently by students in the present study. Both experimental groups had subjects who included their own unsolicited versions of an organizer. Unfortunately, in some instances, information included in the organizer did not show up in the child's written free recall as well. Since strict scoring criteria agreed upon prior to the start of the study prompted the investigators to ignore the extraneous organizer information, some valuable data were lost. This phenomenon could explain, at least in part, the relatively low proportionate recall scores obtained in both experimental groups which is a limitation discussed below.

That no reliable differences were found for text structure instruction on an end-of-chapter recognition task may be due in part to the ease with which students in all groups were able to answer the 18 multiple-choice questions. Inspection of Table 1 will reveal the possibility of a ceiling effect operating for the recognition task.

To the extent that children read naturally occurring text and were instructed by one of the regular fourth-grade teachers during their regularly scheduled social studies class periods, the present study would seem to have ecological validity. Also, the results obtained add to the relatively few number of studies available on the modest transfer effects

for text structure instruction (see Carr, Dewitz, & Patberg, 1983; Taylor & Beach, 1984).

Finally, while the results obtained in this study partially replicate an earlier exploratory investigation of three months duration (in press), there is concern on the part of the investigators for the relatively low proportion of idea units recalled--on average, only 20 percent for the long-term Experimental group. While this compares somewhat favorably with McGee's (1982) good third-grade readers' and poor fifth-grade readers' total amount of recall, future research designs should probably provide for both oral and written free recall measures. This type of design would also permit further testing of Askew's (1983) finding that oral and written response modes have no differential effect on young readers' recall of expository text.

In conclusion, although the sample in this study was small and generalizations or applications to classroom practice unfortunately must await further research, a step has been made toward better delineating the conditions under which fourth-graders' knowledge of text structure may transfer to new learning material. This is no mean goal, given the importance attached to helping youngsters at this age "read-to-learn" from various types of content-related text.

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Table 1
Means and Standard Deviations by Treatment Condition and Task

Task	Treatment Condition: Graphic Organizer (14 days) M	SD	Graphic Organizer (7 days) M	SD	Control M	SD
Tobacco Trade (Free Recall)	5.63[a]	4.60	3.00	2.00	5.50	3.46
New England Harbor (Free Recall)	6.00[b]	4.50	2.63	2.50	3.12	2.64
End-of-Chapter Test (Multiple-Choice)	16.00[c]	2.72	14.88	2.36	14.25	2.92

[a]Expressed in idea units, total possible = 27

[b]Expressed in idea units, total possible = 33

[c]Raw score correct out of possible 18

Abstract

Although children's spontaneous use of top-level structure is known to enhance their memory for expository material, few studies have investigated the effects of direct instruction in text structure in the elementary grades. The purpose of this study was to examine the transfer effects of graphic organizer instruction on fourth-graders' ability to use top-level structure in the comprehension and recall of new content area material. Students were randomly assigned to one of three groups: long-term organizer instruction (14 days); short-term (7 days); and the control. A regularly assigned fourth-grade teacher taught all groups, counterbalanced as to class meeting times. Pretest scores of students' ability to produce written free recalls served as covariates in two one-way ANCOVAs. Only the 14-day Experimentals outperformed the Controls in the number of idea units recalled on the second transfer passage. There were no reliable differences for the first transfer passage; nor were there any on the one-way ANOVA for the multiple-choice test.